

CLAIM AMENDMENTS

Amend claims: 2-13 and add new claims 14-20.

5

1. (Original) A process for the removal of hydrogen sulphide, mercaptans and
optionally carbon dioxide and carbonyl sulphide from a gas stream comprising hydrogen
sulphide, mercaptans and optionally carbon dioxide and carbonyl sulphide, by removing in a
first step most of the hydrogen sulphide, part of the mercaptans and optionally part or most
10 of the carbon dioxide and carbonyl sulphide by washing the gas stream with an aqueous
washing solution comprising 10 to 45 wt% based on total solution of water, 10 to 40 wt%
based on total solution of a physical solvent and 20 to 60 wt% based on total solution of an
amine, which first removal step is followed by a second removal step in which mercaptans
are removed by means of molecular sieves, in which process the amount of mercaptans
15 which is removed by the aqueous washing stream is between 60 and 96 % (of total removed
mercaptans in steps one and two), and the amount which is removed by the mol sieves is
between 40 and 4 % (of total removed mercaptans in step one and two).

2. (Currently Amended) A process according to claim 1, in which the total gas stream
20 comprises 0.05 to 20 vol% hydrogen sulphide, 10 to 1500 ppmv mercaptans and 0 to 40
vol% carbon dioxide, ~~preferably 0.1 to 5 vol% hydrogen sulphide, 20 to 1000 ppmv
mercaptans and 0 to 30 vol% carbon dioxide.~~

3. (Currently Amended) A process according to claim 1 or 2, in which the total gas
25 stream comprises hydrogen sulphide in an amount between 0.15 and 0.6 vol%.

4. (Currently Amended) A process according to claim 3 any of claims 1 to 3, in which
the ratio between the amount of mercaptans (expressed as

ppmv) and the amount of hydrogen sulphide (expressed as vol%) is at least 50, preferably at least 100, more preferably at least 200.

5. (Currently Amended) A process according to claim 4 any of claims 1 to 4, in which the gas stream is natural or associated gas.

6. (Currently Amended) A process according to claim 5 any of claims 1 to 5, in which the physical solvent is sulfolane.

10 7. (Currently Amended) A process according to claim 6 any of claims 1 to 6, in which the amine is a secondary or tertiary amine, preferably an amine compound derived from ethanol amine or a mixture thereof, more preferably DIPA, DEA, MMEA, MDEA, or DEMEA, most preferably DIPA or MDEA or a mixture thereof.

15 8. (Currently Amended) A process according to claim 7 any of claims 1 to 7, in which the aqueous washing solution comprises 20 to 35 wt% based on total solution of water, 20 to 35 wt% of a physical solvent and 40 to 55 wt% of an amine.

20 9. (Currently Amended) A process according to claim 8 any of claims 1 to 9, in which the gas stream obtained in the first step is cooled to a temperature between 5 and 45 °C, preferably between 10 and 35 °C, where after any condensate is separated from the gas stream.

25 10. (Currently Amended) A process according to claim 9 any of the preceding claims, in which the first step is carried out at a temperature of at least 20 °C, preferably between 25 and 90 °C, more preferably between 30 and 55 °C, at a pressure between 15 and 90 bara.

30 11. (Currently Amended) A process according to claim 10 any of the preceding claims, in which in the second step a crystalline molecular sieve is used, preferably a sieve having an average pore diameter of 5 ångström or more, especially about 6 ångström.

12. (Currently Amended) A process according to claim 11 any of the preceding claims, in which the second step is carried out at a temperature of 25 °C and a pressure between 15 and 90 bara.

13. (Currently Amended) A process according to claim 12, any of the preceding claims in which the regeneration gas of the second step containing mercaptans is remixed with the starting gas stream or is treated in a dedicated absorber.

14. (New) A process for the removal of hydrogen sulfide and mercaptans from a gas stream that comprises hydrogen sulfide and a mercaptan, wherein said process comprises:

washing said gas stream with an aqueous washing solution, comprising from 10 wt% to 45 wt% water, from 10 wt% to 40 wt% physical solvent, and from 20 wt% to 60 wt% amine, wherein said wt% is based on the total weight of said aqueous washing solution, to remove from said gas stream between 60 % to 96% of the total mercaptans removed from said gas stream by said process to thereby yield a washed gas stream; and

using a molecular sieve to remove from said washed gas stream a portion of the mercaptans contained in said washed gas stream amounting to between 4% to 40% of the total mercaptans removed from said gas stream by said process to thereby yield a treated gas stream having an amount of mercaptans that is less than that of said gas stream and in the range of from 5 ppmv to 60 ppmv.

15. (New) A process as recited in claim 14, wherein said gas stream comprises from 0.05 to 20 vol% hydrogen sulfide, from 10 to 1500 ppmv mercaptan, and from 0 to 40 vol% carbon dioxide.

16. (New) A process as recited in claim 15, further comprising: cooling said washed gas stream and separating condensate therefrom prior to said using step of said process.

17. (New) A process as recited in claim 16, wherein said using step of said process includes the use of at least two mol sieve reactor vessels each of which contains a bed of said molecular sieve wherein at least one of said mol sieve reactor vessels is operating in an adsorbing mode and at least one of said mol sieve reactor vessels is operating in a desorption mode.

18. (New) A process as recited in claim 17, further comprising: utilizing a portion of said treated gas stream as a regeneration gas for regenerating said bed of molecular sieve of said at least one of said mol sieve reactor vessels operating in said desorption mode to yield of regenerating gas containing mercaptans.

19. (New) A process as recited in claim 18, further comprising: mixing said regenerating gas containing mercaptans with said gas stream that undergoes said washing step.

20. (New) A process as recited in claim 19, wherein said physical solvent is sulfolane.